

REMARKS

Claims 1, 3, 4, 7 and 9-12 are currently amended. Claims 2, 5, 6, 8 and 21 were previously cancelled. Claims 13-15 are original. Claims 16-19 are cancelled without prejudice or disclaimer. Claim 20 was previously presented. Upon entry of the amendment, claims 1, 3, 4, 7, 9-15 and 20 will be active. The amendments to the claims are to clarify claim language. The amendments are supported by the claims as previously presented. No new matter has been added.

Claim Rejections under 35 USC §112, Second Paragraph

The examiner indicated that Claim Nos. 3 and 4 are rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention (page 2 in Final Office Action dated April 28, 2009). Claim 3 and 4 are amended as dependent from Claim1, and accordingly, applicants respectfully request that the rejection be withdrawn.

Claim Rejections under 35 USC §103

(A)amended Claim Nos. 1,3,4,7,9 to 15, 20 (over Ahn and Miyatake):

The examiner indicated that Claim Nos. 1,3,4,7,9 to 17, 20 stand rejected under 35 U.S.C. §103(a) as being anticipated by Ahn, et al. (WO2004/058839; hereinafter, "Ahn") in view of Miyatake et al. (U.S. Patent No. 5,804,655; hereinafter, "Miyatake") (page 2 in Final Office Action dated April 28, 2009).

Specifically, the Examiner pointed out that Ahn teaches seed/core/shell impact modifier wherein said core comprises an alkyl acrylate and a cross-linking monomer, corresponding to the acrylic rubber recited in the claims.

Considering the Examiner's reasoning, applicant classifies the components between the present application and Ahn per items as listed in the below table:

[Table 1]

Items		The present application		Ahn
Seed (weigh part)		0.01-10		0.5-40
Core	Acrylic rubber core (parts by weight)	55-97.5	60-94	50-89.5
	Silicone rubber core (parts by weight)	2.5-45		NA
Shell (parts by weight)		6-40		10-49.5
Structure	Overall structure	Multilayer structure of seed/core/shell	Multilayer structure of seed/core/shell	
	Core structure	A discrete polyorganosiloxane rubber phase is dispersed locally onto the inner part and surface of a continuous acrylic rubber core.	NA	

In addition, the Examiner states that the claims stand rejected as obvious over a combination of Ahn and Miyatake, as Miyatake discloses silicone-modified acrylic rubber particles, prepared by graft-polymerizing 45-5000 parts by weight siloxane rubber onto 100 parts by weight acrylic rubber particles (abstract)(claims 5 and 16).

Considering the Examiner's rejection, applicant has classified the components between the present application and Miyatake per items as the below table:

[Table 2]

Items		The present application		Miyatake		
Seed (parts by weight)		0.01-10		NA		
Core	Acrylic rubber core (parts by weight)	55-97.5	60-94	100	10-90	
	Silicone rubber core (parts by weight)	2.5-45		45-5000		
Acrylic rubber precursor (C)		NA		0.1-5000		
Shell (parts by weight)		6-40		90-10		
Structure	Overall structure	Multilayer structure of seed/core/shell		A two layer structure of core/shell		
	Core structure	<u>A discrete polyorganosiloxane rubber phase is dispersed locally onto the inner part and surface of a continuous acrylic rubber core.</u>		The silicone rubber is finely dispersed in the acrylic rubber.		

(1) As shown in the above table 2, modifying Ahn based on Miyatake, requires an Acrylic rubber precursor (C) not present in the claimed composition. This is supported by Column 13, lines 21 to 38 in Miyatake, that is “The acrylic rubber precursor (C) comprises..., and is used for forming the silicone-modified acrylic rubber particles, being grafted to the acrylic rubber component (A) (and/or the silicone rubber precursor (B) when the graft cross-linking agent is used in the silicone rubber chain(B')) in the silicone-modified acrylic rubber particles (D1) and for adjusting an amount of the silicone rubber chain (B') in the silicone-modified acrylic rubber particles (D2) without lowering the conversion of the silicone rubber precursor (B). Therefore, the component (C) is usually used in case where the content of the silicone rubber chain (B') is not more than 30%, preferably not more than 40% (based on the weight of the silicone modified acrylic rubber articles (D2)).”

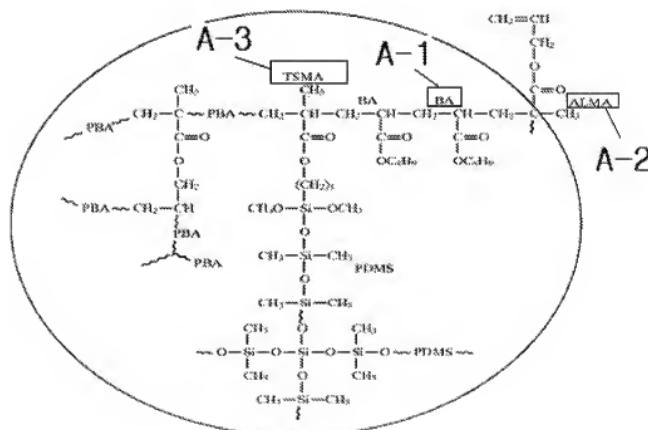
(2) The combination of Ahn and Miyatake require an acrylic rubber precursor (C) and applicants submit that there would be no motivation to eliminate this necessary component from the combination of Ahn and Miyatake.

(3) Further, the acrylic rubber core of Miyatake comprises (A-3) monomer as one required component. That is, Column 2, lines 53 to 67 in Miyatake discloses “in view of the

above-mentioned problems, the present inventors have made intensive studies and as a result, have found the fact that novel composite rubber particles..., in which a precursor of silicone rubber is grafted to acrylic rubber particles, can be produced without using a special apparatus by, in a first step, when preparing an acrylic rubber, copolymerizing a monomer having polymerizable unsaturated bond and reactive silyl group in its molecule and, in a second step, graft-polymerizing a precursor of silicone rubber thereto, ...".

Therefore, the above description states clearly that the prior problems are overcome by "copolymerizing a specific monomer including a polymeric unsaturated bond and a reactive silyl group (that is, (A-3) monomer) in its molecule upon polymerizing the acrylic rubber" in Miyatake.

(4) Furthermore, as shown in Column 12, lines 11 or below, formula (I) (including Table 2) is represented by the structure of the silicone-modified acrylic rubber particles (D2) as follows:

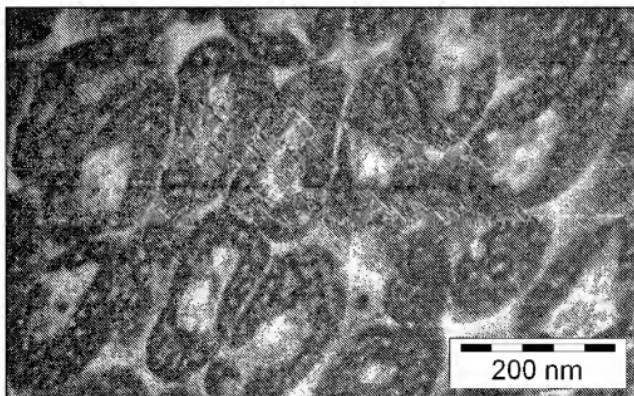


(5) For reference, the abbreviation "TSMA" in formula (I) is gamma-methacryloyloxypropyltrimethoxysilane (described Column 6, lines 34 to 40, and lines 58 to 67), and correspond to the above (A-3) monomers.

(6) In addition, as shown in table 2 of Column 19, TSMA (of (A-3) monomer) is present in a larger amount than (A-2) monomer, and thus the above (A-3) monomer corresponds to one requisite component (as a kind of acrylic rubber) in only Miyatake. For these reasons, Miyatake can not be combined with alkyl acrylate and cross-linking monomer for producing the acrylic rubber core of Ahn (or those of the present application).

(7) With respect of the structure of core, the present application has a core structure such as a discrete polyorganosiloxane rubber phase that is dispersed locally onto the inner part and surface of a continuous acrylic rubber core. However, Miyatake has a core structure such that the silicone rubber is finely dispersed in the acrylic rubber (Column 11, lines 63 to 67).

For reference, applicant encloses herewith a TEM photograph taken under 200nm for an acrylic rubber core for Example 1 of the present application as follows:



- Black dot type small domains correspond to silicone rubber phase (Poly Organo Siloxane dispersed locally onto the inner part).

(8) Specifically, the polymerization type of the present application corresponds to the LIPN(Latex Inter-Penetrating Networking) structure, the LIPN structure means polymerized silicone rubber is simultaneously placed onto an acrylic rubber network

(continuous phase) having a structure with a noninflammable an property. This LIPN type structure is why the present application has a technical aim such that the glass transition temperature of the acrylic rubber is expected to fall within a specific range and thus accomplishes improved impact resistance and weatherability of impact modifiers. Particularly, the present application gives the greatest effects with a small amount of silicone rubber.

(9) In conclusion, applicant submits that the present application would not be obvious to one of ordinary skill in the art at the time the present application was made to modify the impact modifier disclosed by Ahn by grafting an silicone rubber layer onto the acrylic rubber core, as taught by Miyatake, to develop an impact modifier comprising a seed/core/core/shell structure as claimed in the present application. Accordingly, applicants respectfully request that the office withdraw the rejection of the claims over Ahn and Miyatake.

(B) amended Claim Nos. 1,3,4,7,9 to 15, 20 (over Fuji and Miyatake):

The examiner indicated that Claim Nos. 1,3,4,7,9 to 17, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji(U.S. Patent No. 5,298,559; hereinafter “Fuji”) and Miyatake (page 3 of Final Office Action dated April 28, 2009).

Considering the Examiner’s reasoning, applicant classifies the components between the present application and Fuji per items as the below table:

[Table 3]

Items		The present application	Fuji
Seed (parts by weight)		0.01-10	NA
Core	Acrylic rubber core (parts by weight)	55-97.5	Vinyl monomer (core layer)
	Silicone rubber core (parts by weight)	2.5-45	
Intermediate layer		NA	Butadiene rubbery layer
Outer layer		NA	Rigid polymer
shell (parts by weight)		6-40	NA
Structure	Overall structure	Multilayer structure of seed/core/shell	Multilayer structure of core/intermediate /outer/shell
	Core structure	A discrete polyorganosiloxane rubber phase is dispersed locally onto the inner part and surface of a continuous acrylic rubber core.	NA

(1) As shown in above Table 3, the intermediate layer disclosed by Fuji requires butadiene rubber polymer (See Column 3, lines 21 to 22; and Column 4, lines 17 to 19). Also, with respect to the intermediate layer, beside butadiene, a vinyl monomer copolymerizable with butadiene can be employed (See Column 4, lines 20 to 22). Therefore, Fuji teaches second stage polymerization by copolymerization butadiene and alkyl acrylates. However, the present application doesn't contain butadiene in the core composition, and also doesn't prepare the core by copolymerization of alkyl acrylate and butadiene as in Fuji. Furthermore, upon polymerization of intermediate layer, Fuji teaches that the amount of the vinyl monomer to be employed is preferably 90 weight % or less relative to the total amount of the monomers employed in the second stage polymerization (See Column 4, lines 22 to 23). Therefore, 97.0 – 99.9 wt% as the amount of alkyl acrylate recited in the present claims do not fall within those of Fuji.

(2) By the reason of this difference, the acrylic impact modifier of the present application has improved end stability upon injection molding than those of Fuji prepared with butadiene and a small amount of alkyl acrylate. One reason for this is that the alkyl acrylate has more functional group than butadiene, and polymerizes more with the crosslinking monomer than that of butadiene, and thus the prepared core and acrylic impact modifier of the present application have an improved heat stability over Fuji.

(3) The intermediate layer disclosed by Fuji requires butadiene rubbery polymer, Fuji does not teach any rubber core surrounding seed; however, the rubbery core in the present application must surround the seed. In addition, the rubbery core in the present application consists essentially of C1-C8 alkyl acrylate and cross-linking monomer.

(4) In addition to acrylic impact modifier having multilayer structure and a method for manufacturing thereof, the amount of vinyl monomer in Fuji must be 90 weight % or less. However, the amount of C1- C8 alkyl acrylate in the present application requires 97.0 – 99.9 weight %.

(5) In summary, the combination Fuji with Miyatake, does not teach or suggest all the limitations of the claims, and thus the present application would not be obvious to one of ordinary skill in the art at the time the present application was made to alter the impact modifier disclosed by Fuji by modifying the butadiene rubbery layer into an acryl-silicone rubber composition, as described by Miyatake, to develop an impact modifier comprising a seed/core/core/shell structure as described in the present application. Accordingly, applicants respectfully request that the examiner withdraw the rejections over Fuji and Miyatake.

(C) Claim Nos. 16 to 19 (over Fuji and Miyatake, in view of Hamilton and Goldman):

The examiner indicated that Claim Nos. 16 to 19 are rejected under 35 U.S.C. 103(a) as being patentable over the combination of Fuji and Miyatake, and further in view of Hamilton et al.(U.S. Patent No. 6,730,734; hereinafter “Hamilton”) and Goldman et al.(U.S. Patent No. 4,278,576; hereinafter “Goldman”). These rejections have been rendered moot by amendment. Accordingly, the rejection should be withdrawn.

Application No. 10/567,000
Response dated: August 27, 2009
Reply to Final Office Action of: April 28, 2009

In light of the remarks above, applicants submit the application is in condition for allowance. Favorable reconsideration is respectfully requested.

If there are any charges due with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicants' attorneys.

Respectfully submitted,

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